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ABSTRACT

Conducted to determine optimal system designs for cooperative use of an OCLC installation by small libraries, this study developed a comprehensive planning model by formulating the OCLC system, identifying variables that might affect online cooperative cataloging ventures, and developing techniques to measure them. These activities were integrated into an initial planning model which was then field tested at the Auraria Libraries and the Learning Materials Centers of the Community College of Denver North and Red Rock Campuses. Model revisions resulted in a system design for sharing a single OCLC installation. Specific findings of the study are presented in five sections: (1) an outline of OCLC's present and projected services and systems, hardware and software, and support materials; (2) a list of variables that can affect a cooperative system; (3) a list of measurement and documentation methods to quantify and explicate the variables; (4) a planning model and list of specific objectives; and (5) a summary and analysis of the field testing including costs and time savings, cataloging sources, and updating automated circulation databases, and the planning model output, which consists of two potential system designs. A flowchart and various data collection forms are included. (RBF)

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The Potential Uses of OCLC in a Cooperative System and in Non-cataloging Functions.

Anthony J. Dedrick Ph.D

IR009918

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The acquisition and preparation of library materials is basic to the operation of any library. These operations (Technical Services functions) have grown increasingly costly and complex. Because of the repetitive, standardized nature of many technical services routines and products, this area of library activity has traditionally been the most amenable to the growing centralization and automation of library activities.

Part of this increased automation of technical services activities is reflected in the growth of computerized library networks. These are designed primarily for cataloging purposes -- although auxiliary benefits in the areas of interlibrary loan, acquisitions, and cooperative purchasing have been noted (Goldstein, 1974). Foremost of these networks is the Ohio College Library Center (Goldstein, 1974).

The impact of OCLC on individual technical services has been well documented. However, its potential uses in a cooperative system and in non-cataloging functions have been neglected (Hewitt, 1976).

The sharing of OCLC equipment and services by smaller libraries and media centers may well be one of the most significant library developments in the near future. This statement is based upon two facts: first, OCLC has proven itself to be one of the most successful on-line cooperative systems in the library field; second, the majority of libraries and library patrons in the United States have not made use of the potential that OCLC offers. Weber (1976) stated that:

> American academic libraries have reached a watershed that is almost as significant as the change from block printing to printing with movable type. This conclusion is based on the presumption that on-line computer-based operational programs constitute a radical and permanent change in cooperative style. When one is freed from most of the constraints of the card catalog, of the U.S. mail, and of locally prepared cataloging data, this adoption of sophisticated on-line computer-based programs may well be by far the most

> significant change ever achieved in library operations. It is a permanent change in the mode of library operations which should be accomplished during the period 1965 to 1990. (p. 219)

Underlying this concept of sharing was the critical issue of costs. Veaner (1972) wrote:

> Next to books, the most significant cost factor in the library budget is the cost of internal technical processing. If libraries cannot themselves reduce these costs, there is a high probability that the fund allocators will move in and order establishment of more economical means of achieving the library's goals; or alternatively, the goals may be modified. In any case, it is unlikely that an externally imposed arrangement will be liked by librarians, and there is no guarantee that it would assure the best service for patrons. (p. 5)

The following factors constitute additional need for studies such as this one:

1. The lack of research into the effectiveness, both in cost and service, of either time sharing an OCLC terminal among several libraries, or of developing a centralized technical services operation based on OCLC systems.
2. The possibility that major increases in available services would be possible through OCLC, such as union catalogs, improved interlibrary loan service, and union serials lists.
3. The potential that a pilot study such as this can spur the formation of centralized processing and active resource sharing among the smaller school, public and academic libraries, typically not considered viable candidates for sophisticated automation activities.

4. The lack of research on the broader potentialities of an on-line network. Hewitt (1976) indicated that:

> The present survey reveals a number of deficiencies in the published studies describing impact of participation in an on-line network on individual libraries. Perhaps the most significant limitation is the extremely narrow focus on most such studies. The issue of cost and the cost comparison between on-line and alternative systems has generally been the exclusive focus of impact studies available to date. There have been no treatments of the impact of the network on interlibrary loan or other areas of potential utilization of an on-line bibliographic network (p. 58).

OCLC was primarily designed to serve the needs of medium-to-large academic libraries. This group has proven to be its primary clientele (Hewitt, 1976). While there are a number of smaller, private academic libraries which have entered the system on an individual basis, this should not be construed as a trend, because their entry was a result of external foundation funding. Also, the economy of scale implicit in the OCLC system precludes economic use by small libraries with inadequate cataloging volume (Hewitt, 1976).

The medium-to-large academic libraries represent only a minority of libraries in terms of patrons served and total number of libraries (Bowker Annual, 1976).

In 1976, school libraries served over 84 percent of the total United States' school population. There are over fifteen times as many school and public libraries as there are academic libraries (Bowker Annual, 1976). The present situtation is one in which the majority of libraries and library patrons are outside the mainstream of a major service and technological development, such as the Ohio College Library Center.

The purpose of this study was to determine the effectiveness of cooperative use of OCLC hardware and services by small library systems. In order to

determine this potential effectiveness, a planning model had to be developed and applied, and the resultant data analyzed. The effectiveness of cooperative processing has been proven. What remained was to evaluate the potential effect an on-line bibliographic data base would have on cooperative technical services for smaller libraries.

The central hypotheses are: can a planning model be developed which will assist librarians in determining the potential cooperative uses of a single OCLC installation -- both in the traditional cataloging applications and in other areas, such as interlibrary loan and cooperative purchasing? And, can the potential effects of cooperative use of an OCLC installation be determined through the use of the planning model?

The specific objectives of the study were:

1. To develop an OCLC model, identify variables and measurements to quantify the model, and then to integrate these elements into a planning model.
2. To determine the projected costs for technical services and changes in standards and processes due to cooperative use of OCLC equipment.
3. To describe and quantify possible alternatives and levels of service within the shared system.

The scope of this research problem was primarily delineated by two major assumptions. First, the range of services possible through an OCLC based system are considerably greater than those available in a typical manual or batch-mode central processing center. Secondly, these additional services, by themselves, may very well be sufficient justification for centralization of technical service activities. At present, OCLC is primarily designed for cataloging. However, because of the on-line data base, it has also proven

useful in the areas of collection development, interlibrary loan, and cooperative buying (Markuson, 1976).

This study was focused on the development of a planning model for the cooperative use of a single OCLC installation by multiple libraries, as well as on the conclusions based upon field test data generated by the model. An essential feature of this development was a constant cycle of feedback from the outlining of the initial OCLC model to the final planning model.

The final, comprehensive planning model was developed through the following steps:

1. Initial outlining of the OCLC model.
2. Revision of the OCLC model.
3. Identification of variables that might affect the system.
4. Development of measures and documentation techniques for the variables identified in the previous step.
5. Integration of all the preceding activities into an initial planning model.
6. Field testing the planning model with three libraries.
7. Revision of the planning model based upon field testing experience.

Research of this type is inherently limited. The limitations of this study were centered on the model's capacity for generalization and on its methodology. However, the identification of causative factors and relevant data should suggest corrective actions which can then be generalized to comparable situations.

Methodological limitations were primarily those associated with modeling and simulation techniques. Very seldom will any type of model represent the whole set of relationships and variables involved, and the abstract nature of these activities is in itself a problem. Commitments made by simulation activities or decisions are artifically made "on paper" and do not involve the

risks associated with actual commitments.

Although one of the libraries in the study is presently on the OCLC system, it does not make use of all of the services available through this system. Therefore, a model of the entire OCLC system was needed so that an overall picture of the services and sub-systems available through OCLC could be evaluated. Those services and sub-systems which had potential use in a cooperative system could then be identified and applied to the planning model that followed. An example would be 'Archival magnetic tapes', which was selected as the method for production of microfiche union catalogs.

Narrative representations of the following aspects of the OCLC system were used:

1. Hardware/software configurations -- a description of the computer hardware, communication links, and software systems of OCLC.
2. Presently available services and systems -- actual components offered by OCLC in use (not the variety of applications and modifications implemented by individual users).
3. Projected services and systems -- components which OCLC will be offering in the future.
4. Existing system modifications/applications -- the various applications which were not developed by OCLC, but ones which were implemented by users as a result of system modifications. An example would be the use of OCLC new accessions tapes as machine-readable input for updating an on-line circulation system.
5. Potential system applications -- potential applications/ modifications which the individual institution can make,

rather than OCLC offering them. Hewitt (1976) pointed out that the potential uses of the system (OCLC) in areas such as cooperative buying and interlibrary loan have been neglected.

Identification of variables

The failure to carefully evaluate all of the potential variables that might affect a cooperative cataloging/processing center is a recurrent theme in the literature. The present evaluation included typical elements, such as volume of ordering and duplication. It also included variables such as the adequacy of existing manual and/or automated procedural systems that will be used in a proposed cooperative effort, as well as institutional characteristics.

The examination and analysis of procedures/systems that will actually be used is essential and often neglected in reported feasibility studies. An example is the study done by Leonard, Maier and Dougherty (1969) which preceded the establishment of CALBPC. Extremely thorough analysis of almost every conceivable variable was made, except the routines at the University of Colorado Library. They assumed that a new system would be developed, rather than what subsequently happened -- the added cooperative workload was "shoehorned" into the existing routines. Veaner, in his 1972 CALBPC consulting report, noted that the inadequacies of internal procedures and systems was a major problem of CALBPC.

Measurement of variables

Once the variables had been identified, a number of techniques were used to both measure and quantify them and also to document their interrelationships. Basically, all of the variables were catagorized in one of two ways:

1. Measurable elements, such as required cataloging/processing volume.
2. Other variables, such as the improvement of services which are possible, but whose value cannot be precisely measured. An example of improved services would be the faster cataloging turn-around time which results in a patron having access to more current material.

Development of the initial planning model

The OCLC model, the variables, and the measurement techniques were all integrated to form a comprehensive planning model. The merging of these elements was accomplished by identifying and linking together those variables which affected particular elements of the OCLC model or the planning model as a whole. The appropriate measurement techniques were then identified and applied to those variables.

Testing the planning model

The model was field tested by applying it to the Learning Materials Centers of the Community College of Denver, North and Red Rocks Campuses, and the Auraria Libraries. Applicable OCLC sub-systems were used and the associated variables were measured and documented.

The outcome of this activity, in conjunction with revisions, was the parameters of optimal system design for the given institutional setting. For example, what sub-systems should or should not be shared, or how much of a particular activity, such as cataloging, could be accomplished on a cost-effective basis.

Revision of the planning model

The planning model was revised on the basis of the field testing as needed. The field testing provided data on how effectively particular variables

could or could not be quantified and on how well a given group of variables actually delimitate a system or sub-system.

The central hypotheses of the present study are: can a planning model be developed which will assist librarians in determing the potential cooperative uses of a single OCLC installation -- both in the traditional cataloging applications and in other areas, such as interlibrary loan and cooperative purchasing? And, can the potential effects of cooperative use of an OCLC installation be determined through the use of the planning model?

The findings showed that a planning model could be developed which would show the potential effect of cooperative use of a single OCLC installation. The specific findings of this study are presented in five sections:

1. An OCLC system model,
2. A comprehensive list of variables that can potentially affect a cooperative system such as OCLC. This section includes a summary of variables grouped according to:
   A. Efficiency of the technical services departments.
   B. Projected efficiency of OCLC applications.
   C. Miscellaneous variables.
3. A list of measurement and documentation methods which can be used to quantify and explicate the variables identified in step two. Included in this section are:
   A. Variables with associated forms/data collection tools.
   B. Measurement and documentation of general cost and speed variables.
4. A planning model which integrates the results of the first three steps. A list of specific objectives for the planning model is also included.

5. Results of the planning model field testing. This information is summarized in two sections: one, Summary and analysis of field testing data, and two, Planning model output.

OCLC system model

The following model consists of an outline of: A.) hardware/software, B.) presently available services and systems, C.) projected services and systems, D.) potential system applications, and E.) other (support materials).

A. Hardware/Software:

1. Computers:
   a. Four Xerox Sigma 9's -- on-line services.
   b. One Xerox Sigma 7 -- off-line for administrative purposes.
   c. One Xerox Sigma 5 -- card production.
   d. Six Data General minicomputers -- front end processing.
2. Terminals:
   a. OCLC Model 100 CRT's -- 15" screen with 192 displayable characters. Manufactured by Beehive Medical Electronics.
3. Communications:
   a. Dedicated telephone lines.
   b. Regular telephone lines for dial-up service.
4. Software:
   a. Primarily COBOL computer language.

5. Data Base:

   a. Full cataloging records -- 2.8 million as of March, 1977.

B. Presently available services and systems:

1. On-line production of catalog cards.

2. New accessions lists.

3. Serials check-in.

4. On-line bibliographic data base.

5. Archival magnetic tapes.

C. Projected services and systems (from page fifteen of OCLC Budget Plan 1977/78, Columbus, Ohio; April 5, 1977):

ENHANCEMENTS TO IMPROVE SYSTEM PERFORMANCE CATALOGING (On-line)	
Two-level Indexing Procedures	1A*
'Enhance' Function	2(G)
On-Line Union Catalog Changes	2
Handling of Holdings	3
Staging File (Initial Study)	3(P)
Search-Key Qualification (Initial Study)	3
ENHANCEMENTS IN EXISTING SUBSYSTEMS CATALOGING (Batch)	
Catalog Card Production (Complete redesign and extention to all types of materials)	1A

1A* - Highest development priority

1B - Development and/or testing depends on availability of facilities and resources outside of R&D.

2 - Development underway, subordinate to 1.

3 - Not in works but staff assigned

4 - Not scheduled (N/S); no staff assigned

G - Grant or contract supported

(G) - Partial grant or contract support.

(P) - Proposal in preparation or submitted for grant support.

Deferred Record Processing/MARC Record Loading	1A(G)
OCLC-MARC Subscription Service (Register of Additional Locations and Documentation)	1A
OCLC Number Cross Reference Capability	1A
Retrospective OCLC-MARC Subscription Service Project	1B
On-Line Union Catalog Additions (NLC and NLM)	2
CATALOGING (On-Line)	
Additional Index Keys (Su Docs Number)	3
Authorizations/Logon Redesign	3
On-Line Authority Capability	4(P)
Non-Roman Alphabet Capability	4(P)
ISBN, ISSN, CODEN Check Digit Validation	4
Local-Data Records for Monographic Materials	4
SERIALS CONTROL	
Recovery Software	1A
Claims	2
Modified Search and Retrieval	3
Union List Holdings	4(P)
Automatic Check-In (Version 2)	4
Other Extensions and Improvements	4

GENERAL SYSTEM SERVICES	
Searcher (Version 2)	4
Search Technique Modifications	4
Tape Labeling Procedures	4
Screen Image Manager	4
System Dispatcher	4
NEW SUBSYSTEMS	
ACQUISITIONS	
Survey Report	1AG
User Manual (draft)	1AG
Preorder Search	1AG
Order Transmission	2
Order Generation	1AG
On-Line Testing	2
INTERLIBRARY LOAN	
Request Generation	1AG
Response Generation	1AG
Pending Message File	1AG
On-Line Testing	2G
Financial Data and Reports	4(P)
Statistical Data and Reports	4(P)
Fully Automatic Referral of Requests	4(P)
COMMUNICATIONS	
Network Supervisor	1A(G)
NELINET Communications Processor	1A
ADMINISTRATIVE SYSTEM	
Unified Billing Component	2

CIRCULATION CONTROL

Functional Specifications	4(P)
Review of Existing Systems	4(P)

PUBLIC SERVICES

Evaluation of STAIRS	1B
Implementation of BASIS on a minicomputer	4(P)

D. Potential system applications.

1. Interlibrary loan.
2. Cooperative purchasing
3. Updating of automated circulation data bases.
4. On-line catalog of holdings.
5. Reference -- i.e., bibliographic verifications.
6. Acquisitions.
7. Subject searches.
8. Microfiche catalogs.

E. Other:

1. Support materials:
   a. Training workbook with cassettes.
   b. On-line cataloging manual.
   c. Troubleshooting manual.

Comprehensive list of variables

The list of variables that affect a cooperative on-line system were organized according to the following.

1. The existing efficiency of the three technical services departments.
2. The projected efficiency of pertinent OCLC applications.
3. Miscellaneous variables.

Efficiency of the technical services departments

Variables that affect efficiency were primarily categorized in two ways: cost and speed. Speed was viewed as both a separate variable (faster turn-around time being the measure of service), and as part of the general cost variable (the labor costs). These two variables apply to every functional area in a given technical services department and are augmented by other variables unique to a particular activity.

The eight functional areas were defined, and the variables that affect performance (other than cost, speed, and quality that are always applicable), were then attached to the appropriate function.

1. Pre-order verification -- this activity was divided into two areas: a.) Establishing that the item exists, and determining the exact author, publisher, etc., and where the item may be obtained, and b.) Whether or not the library already has a copy of the work, and if so, is an additional copy wanted.

   VARIABLES:

   a. Percentage of trade books (in-print, English language titles).
   b. Quality and availability of bibliographic tools.
   c. Current order duplication.

2. Order procedures -- selection of the vendor and actual ordering of the materials.

   VARIABLES:

   a. Percentage of trade books.

3. Accounting and bookkeeping -- provision of fiscal data for management purposes.

   VARIABLES:

   a. Type and level of detail in local accounting required.

b. Vendor performance (Promptness of shipments and accuracy of invoices.

4. Order receipt -- receipt of the physical items and checking against appropriate records.

VARIABLES:

a. Vendor performance.

5. Cataloging -- assignment of call numbers, subject headings, and descriptive notes.

VARIABLES:

a. Percentage of trade books.

b. Current order duplication.

c. Source of cataloging.

d. Amount of original cataloging.

6. Processing -- preparation of items for shelving. This includes property stamping, labelin , etc.

VARIABLES:

a. Current order duplication

b. Source of cataloging.

7. Filing and catalog maintenance -- filing of catalog cards and updating the subject and cross-reference files.

VARIABLES:

a. Current order duplication.

b. Source of cataloging.

Projected efficiency of OCLC applications

These variables were identical to those listed which affected the efficiency of the technical services departments. The only difference is that this same group of variables was substituted, or simulated, on the

OCLC system to provide comparative data.

Miscellaneous variables

1. General institutional characteristics.
2. General library characteristics.
3. Interlibrary loan activities.
4. Current order duplication between institutions.
5. New services/systems possible with the use of OCLC.
6. Expanded or improved services/systems possible with the use of OCLC.

Measurement and Documentation Methods

The measurement and documentation of variables was accomplished in two ways:

1. Specific variables were listed, data was collected, and then summarized on the appropriate form(s), or described in a narrative.
2. The general variables of cost and speed were determined. Random sampling was utilized whenever the subject population was excessively large.

Variables with associated forms/data collection tools

Variables	Data collection tools
1. Availability of bibliographic tools.	Acquisition Searching/Verification Summary.
2. Current order duplication	Narrative report.
3. Level and type of local accounting required.	Flow charts; sample forms.
4. Vendor performance.	Vendor/Publisher Summary.

continued on next page

5.	Source of cataloging.	Monographic Cataloging Data Sheet.
6.	Amount of original cataloging	Monographic Cataloging Data Sheet.
7.	OCLC performance.	Simulation and comparison of selected technical service activities on OCLC equipment.
8.	Institutional characteristics.	Institutional Organization Chart; Institutional Data Sheet.
9.	General library characteristics.	Institutional Data Sheet; Library Materials Expenditure Summary.
10.	Interlibrary loan activities	Interlibrary Loan Summary.
11.	New services possible with OCLC	Narrative report; OCLC Model.
12.	Improvement of services possible with OCLC.	Narrative report; OCLC Model.

Measurement and Documentation of General Cost and Speed Variables

The unit cost of each activity or process was determined by summing the unit materials cost, unit equipment cost, and unit personnel cost. All data was summarized on the Unit Cost by Activity Summary form.

Unit materials cost: the various supply items used in a particular activity were identified and their cost determined.

Unit equipment cost: unit equipment cost was obtained by:

1. Dividing the initial cost of the item by the expected lifetime, to provide an annual cost.
2. Adding to this annual cost the yearly contract services expense.
3. Dividing the new amount by the percentage of operational time the equipment is used for the given activity. This is to compensate for situations where a particular machine is used for a number of different tasks.

4. Dividing the total number of items produced (catalog card sets, etc.) into the figure from step "3".

Unit personnel cost: unit personnel cost was obtained by multiplying Hourly wage by Standard time.

Hourly wage: This was determined by subtracting vacation, sick, and holiday hours reported from total annual work hours. This figure was then divided into total annual salary to give an hourly cost.

All data relating to General Cost and Speed Variables was summarized on the appropriate data collection forms.

Standard time (Daugherty, 1966):

Standard time = A x B x C

Where: A = Mean time per activity

B = Personal rating factor. This was a value judgment determined by the participants during timing activities.

C = Standardizing factor = 1.48. This factor was used to compensate for worker allowances such as rest periods, personal needs, and unavoidable delays. Voos (1965) listed the following standard worker allowances which are difficult to obtain through direct time measurement:

1. Unproductive time = 16.3%
2. Supervision = 6.5%
3. Administration = 3.8 %
4. Instruction = 5.7%

The total of 32.3% was then entered into the formula developed by Daugherty (1966) for calculating the standardizing factor: C = 100/100-A, where A = worker allowances. Therefore,

C = 100/100 - 32.3 = 1.48

Time performance: time performance was determined in two phases:

1. Job descriptions, along with interviews of participating staff and supervisors, were used to identify appropriate jobs and individuals.
2. Flow charts were developed to identify sub-tasks which could be timed.

Subjects timed were those who normally performed the specified tasks, and who were reasonably experienced. This eliminated unusual fluctuations due to the use of inexperienced or recently employed staff.

Random sampling: since the studies sometimes required sampling of work routines and a variety of technical service files and records, it was decided that a 95 percent confidence limit be established. Randominzation in the sample selection was accomplished by use of a random numbers table. The following formula (Daugherty, 1966) was used to calculate adequate sample size:

$$N' = \frac{1600 \left[N \sum X^2 - \left(\sum X \right)^2 \right]}{\left(\sum X \right)^2}$$

Where N' = The number of observations needed to meet the criteria of 95 percent confidence with a five percent plus or minus variation.

N = The number of observations actually taken.

$\sum X$ = The sum of the values of all the observations.

$(\sum X)^2$ = The square of the sum of the values of all the observations.

$\sum X^2$ = The sum of the squares of the values of all the observations.

1600 = The square of the constant used at this confidence level.

Determination of file size was done by compressing the slips or cards in each file drawer, measuring them, and then randomly selecting one inch of stock in each drawer to be counted. This technique was used when the department involved did not already have actual data relative to file size, i.e., number of books on order, or number of interlibrary loan transactions.

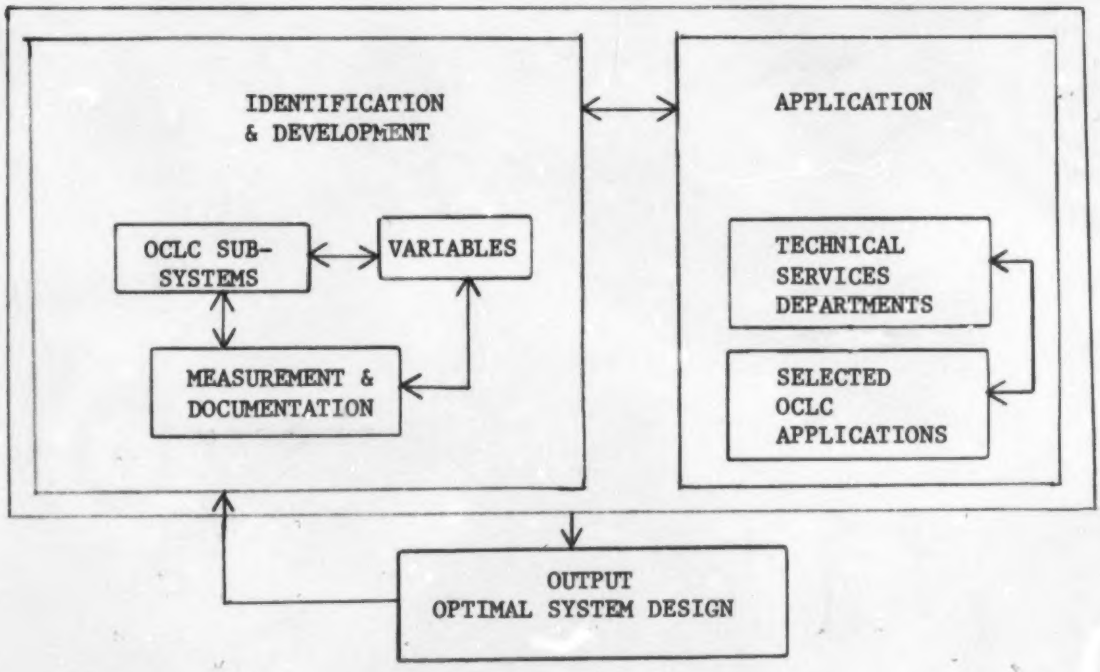
Planning model

The primary goal of the planning model diagrammed on the following page was to determine what functions or services provided by OCLC could be shared on a cost-effective basis by multiple institutions. The model consisted of two major activities.

1. Identification and development.
2. Application.

The result of these two activities was the projected optimal system design for the sharing of a single OCLC installation.

PLANNING MODEL



Specific objectives

1. Identification and description of both the generalized OCLC system and all of the principal subsystems, such as cataloging and pre-order verification.
2. Identification of variables that can affect an on-line, cooperative library system.
3. Development of methods which would document and qualify the variables identified in step two above.

4. Identification and documentation of cost and time factors which affected the selected functions in the technical services departments and the OCLC system.
5. Combine the results of the preceding four steps to provide the parameters of optimal system design for a given institutional setting.

Results of the planning model field testing

The Auraria Libraries and the Learning Materials Centers of the Community College of Denver North and Red Rocks Campuses were selected for field testing of the planning model. A series of personal visits was made to each institution for the purpose of:

1. Explaining the nature and purpose of the field testing.
2. Securing the approval of the three library directors.
3. Collecting general budget and operating data, which was summarized on the following forms: Interlibrary Loan Summary, Institutional Data Sheet, Monographic Cataloging Data Sheet, Library Materials Expenditure Summary, and Vendor/Publisher Summary.
4. Explaining to the library staffs the procedures required for collecting data. This was summarized on the following forms: Acquisitions Searching/Verification Summary. Catalog Copy Searching Summary, Equipment Cost Analysis Summary, and Unit Cost by Activity Summary.
5. Flow charting of selected activities.

6. Collecting data for narrative summaries of current order duplication and level/type of local accounting required.

Once institutional technical services activities were quantified, selected routines were compared with OCLC systems to determine possible cost savings and improvements in service.

Summary and analysis of field testing data

Cost savings: data from this study showed that the Community College of of Denver-North Campus spent $1,614.00 for original cataloging of 300 titles in 1976-77. The Red Rocks Campus spent $1,254.00 for original cataloging of 293 titles during the same period. The North Campus would save 43.3 percent and the Red Rocks Campus would save 54.4 percent of these costs by using the OCLC terminal.

Card catalog maintenance is the other area where cost savings are possible. Card catalog maintenance at the Auraria Libraries is $20,400.00 annually. Costs for filing and new card catalog units would be approximately the same for the two community colleges on a proportional basis. Data from the 'Library Materials Expenditure Summary' charts showed that the Red Rocks Campus' acquisition of materials was 13 percent of the amount acquired by the Auraria Libraries. North Campus acquired 16 percent of the amount.

Card catalog maintenance is directly proportional to the amount of material acquired and cataloged. The more material purchased and cataloged, the more cards there will be for filing, and more storage units will be required.

Based upon the proportional nature of card catalog maintenance, the following maintenance costs would be saved:

1. Auraria Libraries - $20,400.00 (maintenance)
   minus $12,000.00 (microfiche catalog) = $8,400.00
   as savings.

2. North Campus - .16 (percent of Auraria Libraries' acquisitions) X $20,400.00 (Auraria Libraries' maintenance) = $3,264.00 (maintenance) minus $1,300.00 (microfiche catalog) = $1,964.00 as savings.
3. Red Rocks Campus - .13 (percent of Auraria Libraries' acquisitions) X $20,400.00 (Auraria Libraries' maintenance) = $2,652.00 (maintenance) minus $1,082.00 microfiche catalog) = $1,570.00 as savings.

The combined cost savings for the insitutions can be summarized as follows:

1. Auraria Libraries - $8,400.00 in maintenance.
2. North Campus - $2,663.00 ($1,964.00 in maintenance and $699.00 in original cataloging savings).
3. Red Rocks Campus - $2,040.00 ($1,575.00 in maintenance and $465.00 in original cataloging savings).

Time savings: for a comparable activity, it was found that the Auraria Libraries were usually more efficient. This was due to three factors:

1. Use of the OCLC terminal in original cataloging.
2. Salaries for support staff were lower in the Auraria Libraries, on the average.
3. Specialization -- because of the Auraria Libraries' size, there was more job specialization and as a result, the searching and cataloging speeds were faster.

Acquisitions: all three institutions relied heavily on jobbers, with Baker and Taylor being the most utilized. One of the reasons for the cost-effectiveness of Baker and Taylor supplied cataloging was that this activity was part of acquisitions, and consequently no separate routine was needed.

Current order duplication: the participants felt that savings were

possible through a reduction of inter-institutional duplication. However, the possible savings would not offset the cost of union catalogs.

Acquisitions searching: no significant gains were possible until additional OCLC terminals were obtained and the respective institutional shelf-lists were inputted.

Cataloging sources: original cataloging was the only type of activity which was cost-effective, i.e., the Auraria Libraries' unit cost on original cataloging was less than one-half that of the other two participants (Community College of Denver, North and Red Rocks Campuses). The opposite was true of the vendor supplied cataloging, which was heavily utilized by the two community colleges. In that instance, the unit costs were almost one-third those of the Auraria Libraries. In follow-up discussions with personnel from the three schools, it was discovered that although the Auraria Libraries did not use vendor cataloging because of low quality and conflicts with their existing bibliographic records, the community colleges considered the cataloging adequate for their needs. While the Auraria Libraries' total cataloging costs were higher than the other two participants, the turn-around time was one-half to one-sixth as much. This was a measure of service in that the users received their materials from one to twelve weeks faster in the Auraria Libraries.

Accounting systems: this would not become a factor until the Acquisitions sub-system of OCLC becomes operational.

Interlibrary loan: the activity was minimal -- the institutions had less than fifty transactions annually.

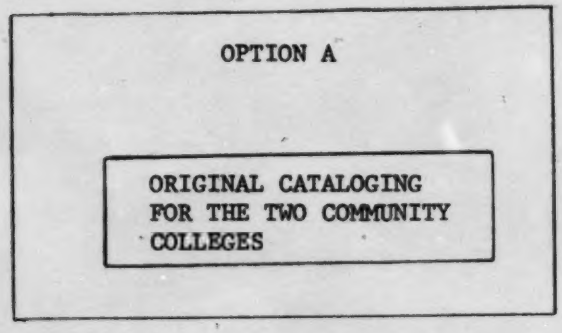
Reference: this would primarily be bibliographic verification (determining authorship, edition, publication date, etc), and would be possible on a telephone request basis from the community colleges to the Auraria Libraries.

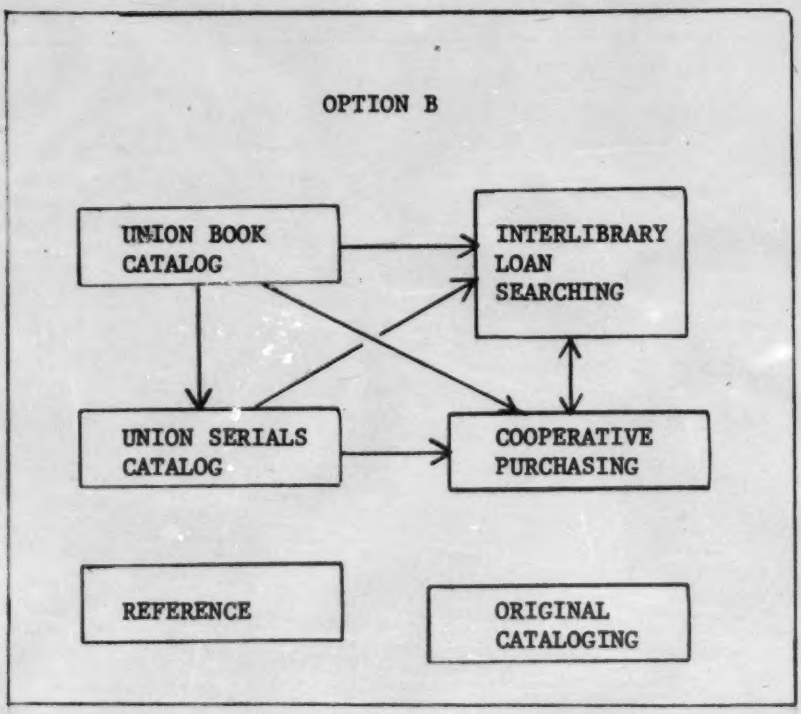
Updating of automated circulation data bases: this would cost $.13 per record for commercial vendor services. It would be limited to institutions having compatible circulation systems. At present, only the Auraria Libraries has an automated circulation system (C.L.S.I., which utilizes a mini-computer and disc storage). Updating would be accomplished by having OCLC provide magnetic tapes of the Auraria Libraries' holdings. These tapes would then be re-formatted and loaded onto disc packs, which could then be loaded onto the circulation system's disc drives. The cost would be $.10 for re-formatting and $.03 for the tape-to-disc transfer.

Planning model output

The field testing of the planning model resulted in two potential systems diagrammed on the following page. The first system (Option A) was based solely on cost-effectiveness, and no service enhancements were considered. The second system (Option B) was a combination of cost-effective applications and service enhancements, such as interlibrary loan searching, unified holdings lists, and cooperative purchasing.

POTENTIAL SYSTEM OPTIONS





Option A: the OCLC terminal will be used to provide original cataloging for the two community colleges. This assumes that almost all of the original cataloging items of the two community colleges will be found in the OCLC data base. This assumption is based upon an examination of the original cataloging titles of the two colleges. No esoteric or obscure titles were found.

North Campus:

$2.33 (Auraria Libraries' unit cost for cataloging/editing using OCLC) was divided by $5.382 (North Campus' unit cost for original cataloging) to equal a 43.3 percent savings.

Red Rocks Campus:

$2.33 (Auraria Libraries' unit cost for original cataloging using OCLC) was divided by $4.279 (Red Rocks Campus' unit cost for original cataloging) to equal a 54.4 percent savings.

To this would be added two initial start-up costs. First, $100.00 would be required for each community college to establish an OCLC profile (the catalog card format). Second, $250.00 would be required to purchase an acoustic coupler to utilize existing community college instructional terminals on a dial-up basis. All other potential applications were not cost-effective or not possible, due to the existence of only one terminal at the Auraria Libraries.

Option B: the two community colleges will use the OCLC terminal for original cataloging, and all three institutions will utilize OCLC's potential to provide the following service enhancements:

1. Union book and serial catalogs.
2. Interlibrary loan seraching.
3. Reference.
4. Cooperative purchasing.

Service enhancements:

1. Production of microfiche union book catalogs -- this would provide biblipgraphic access for users to a much larger data base, particularly in regard to the two community colleges. In addition, a union catalog would be required as the first step in implementing a coopera-

tive purchasing program (this enables requestors to determine if other libraries in the system have the particular item). The existing card catalogs would be closed and a new union microfiche catalog utilized.

Auraria Libraries:

$12,000.00 per year -- includes four cumulated microfiche catalogs.

North Campus:

$1,320.00 per year -- includes four cumulated microfiche catalogs.

Red Rocks Campus:

$1,080.00 per year -- includes four cumulated microfiche catalogs.

Other Costs:

Additional microfiche readers at approximately $600.00 each would need to be purchased. The number needed would depend on projected usage and the number and use of existing machines.

Although the production of a union book catalog will be primarily for service enhancement, it would offset considerable in-house costs for catalog maintenance activities, such as filing cards, revising, etc. For example, the Auraria Libraries' cost of a book catalog will be $12,000.00. This would result in an annual savings of $8,400.00 due to offsetting costs.

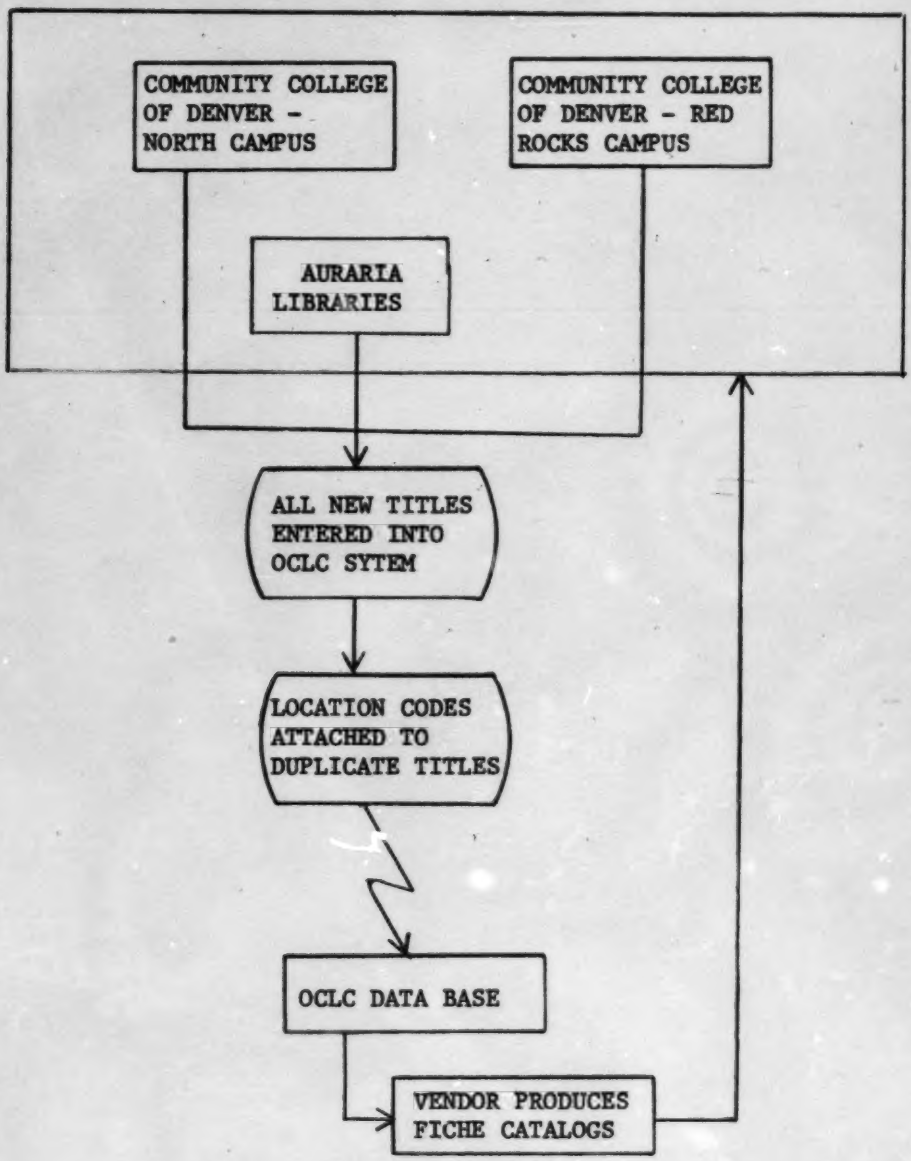
These costs would be:

a. Card catalog filing ($18,000.00 annual labor cost would be eliminated by a microfiche catalog).

b. New card catalog file drawer units ($2,400.00 annually for four units).

Production of microfiche union serials catalogs -- this, like the book catalog, would provide bibliographic access for users to a much larger pool of journals, newspapers, and other serially issued materials.

FLOW CHART OF UNION CATALOG PRODUCTION


COMMUNITY COLLEGE OF DENVER - NORTH CAMPUS
COMMUNITY COLLEGE OF DENVER - RED ROCKS CAMPUS
AURARIA LIBRARIES
ALL NEW TITLES ENTERED INTO OCLC SYTEM
LOCATION CODES ATTACHED TO DUPLICATE TITLES
OCLC DATA BASE
VENDOR PRODUCES FICHE CATALOGS

2. Interlibrary loan -- the efficiency of interlibrary loan activity (percentage of requests filled and turn-around time) can be expected to increase considerably, particularly for the two community colleges. The existence of a union catalog eliminates the sending of requests without knowing if the target library actually owns the desired items. The use of the OCLC terminal for searching was not possible at this time, because the existing terminal was completely dedicated to cataloging. However, with the purchase of a second terminal in 1979, it has been possible to provide time for inter-library loan searching. The potential effect on interlibrary loans (with the second terminal available) would then be considerable for two reasons:

    a. No time-consuming, "blind" requests would be sent, because the title called up from the OCLC data base on the CRT terminal has attached to it a list of codes for libraries which own a copy of the item. The result is that the requests can then be sent to the nearest library owning the item. At present, a request is simply routed from one library to another until a match is found (a process which can take several months).

    b. The OCLC data base would provide an enormous increase over the tri-institutional book catalog, in terms of participating libraries and number of records. Access to approximately 260,000 titles held by three libraries would be expanded to over 6,500,000 titles held by over 2,000 libraries.

Interlibrary loan would also be strengthened as a result of cooperative buying, because more unique titles would be purchased by the libraries (one of the objectives of cooperative purchasing is the reduction of duplicate titles purchased).

3. Reference (bibliographic verification) -- verification requests were not particularly numerous, however, the community colleges had no way to meet those requests. Access to the OCLC data base would solve this problem.
4. Cooperative purchasing -- samples were taken from order files, and the librarians were asked to indicate which titles they would not purchase if they knew the titles were held by either of the other two libraries (using a union book catalog as a locator tool). The 11 percent selected at the Red Rocks Campus would result in 232 titles, and the 24.4 percent at the North Campus in 597 titles. This could result in a significant impact on their collections because the money saved could be used for purchasing unique titles.

Summary

The purpose of this study was to:

1. Develop a planning model for cooperative use of a single OCLC installation.
2. Determine the potential effects of cooperative use of a single OCLC installation.

The basic OCLC model was formulated, variables which affect on-line, cooperative cataloging ventures were identified, and techniques were developed to measure them. The final planning model was field tested at the three institutions. The result of these activities, and the primary objective of the planning model, was the optimal system design(s) for cooperative use of an OCLC installation in a given institutional setting. The optimal system design(s) reflected the potential effects of cooperative use of a single OCLC system.

General conclusions

Objectives of the study: based upon field testing results, the planning model did meet the primary objective, which was to determine what the optimal system design(s) would be for cooperative use of an OCLC installation by multiple institutions. In addition, the OCLC sub-systems which could be shared, and the activities which could be performed on a cost-effective basis, were identified.

The constant cycle of feedback from the participating staff members was one of the most critical elements in the study. Most of the revisions and additions to the final planning model came about as a result of this interaction.

Generalizability: a useful feature for any model is its capacity for generalization -- can it be used in a variety of settings given certain constraints? In terms of this concept, the model could be applied to any situation meeting the following two criteria: first, the participants must include at least one

smaller library, and second, one of the participants must be an OCLC member. Beyond these two criteria, there were two major unknown variables cited in the 'Recommendations for Further Research' that could affect the application of the model. These are the interrelated variables of distance and data transmission techniques.

The applications of this planning model to a situation involving long-distance communication links would not be difficult. The additional costs and fees involved would be calculated and applied to the proposed system cost. This also points to the advantage of an on-line shared system such as OCLC over the traditional book processing centers. The time-consuming physical handling and shipment of material from the central processing unit to the participants is eliminated. Instead, only bibliographic data is electronically transmitted at high speed.

Advantages for smaller libraries: the advantages for smaller libraries participating in the use of a single OCLC installation exist in two areas: one, cost savings, and two, service enhancements. The service enhancements are the most important, although significant cost savings are also a primary consideration. Cost savings occur in original cataloging and in catalog maintenance. Service enhancements occur in the following:

1. Faster turn-around time for original cataloging.
2. Interlibrary loan.
3. Improved bibliographic quality.
4. Union catalogs and lists.
5. User access to the large OCLC data base.
6. Reference and general bibliographic verification.
7. Cooperative purchasing.

Specific conclusions

Development of the OCLC model: the initial model proved to be a useful representation of the OCLC system. Essential system features and capabilities were identified, and minor revisions were required based on additional information. Model changes and additions were as follows:

Model changes:

1. B.5. New Accessions Lists was changed to B.5. Archival Magnetic Tapes. OCLC does not provide the lists -- they are produced by selected commercial vendors from tapes supplied by OCLC.

Model additions:

1. A.1.d. Six Data General minicomputers -- front end processing.
2. E. Other
    1. Support materials.
        a. Training workbook with cassettes.
        b. On-line cataloging manual.
        c. Troubleshooting manual.

Identification of variables: the list of variables proved to be adequate, based on the field testing results, i.e., no new variables were added to the model.

Measurement of variables: again, the results of the field test indicated that the measurement techniques used were adequate. The precision of time study measurements used in this study is unknown. However, the per-item cataloging costs and mean times did provide the required comparative data for the planning model. A deliberate attempt was made to develop data collection tools which would be comprehensive in nature, enabling them to be applied in a variety of institutional settings.

Development of initial planning model: the integration of the validated OCLC model, the pertinent variables, and the measurement techniques resulted in

the first series of revisions. It was discovered that many of the variables initially listed were not associated with any particular aspect of the OCLC system. They were, nevertheless, required if the model was to have generalized applicability.

Field testing and final revisions of the planning model: this final stage of the developmental process resulted in the majority of the revisions. No major changes resulted from the field testing. However, innumerable minor revisions and additions were made, especially in the data collection tools.

Recommendations for further research

On the basis of the conclusions and findings of this study, the following recommendations for further research are made:

1. A nation-wide survey should be undertaken to complement the studies by Hewitt (1976) and Markuson (1976). The dual focus of this survey would be the non-cataloging uses of OCLC and the cooperative ventures, if any, that the various OCLC libraries have attempted.
2. A uniform, standardized list of variables that affect cooperative cataloging or processing centers would simplify future planning efforts.
3. A Management Information System (M.I.S.) is needed to complement the planning model. It is essential if the impact of cooperative on-line ventures is to be measured and used as a guide for future action.
4. A uniform set of time standards for performing the various Technical Service tasks would be useful. The standard activities list developed by Leonard (1969) needs to be supplemented by a corresponding list of standard times.
5. The various options relative to data transmission from a single OCLC installation to the other system participants needs to be examined.
6. The impact of geographical distances on cooperative processing systems

needs to be thoroughly analyzed and documented.

Application of the planning model would be considerably simplified by further research into the following areas:

1. Standardized list of variables that affect cooperative cataloging or processing centers.
2. Management Information Systems for libraries
3. Uniform time standards,

Any planning on a state-wide basis would require additional research in the areas of data transmission and the impact of geographical distances.

There is a need for further verification and elaboration of the present study's data. Replication of this study with another group of libraries would greatly assist in the on-going and essential process of refinement and elaboration of this type of planning model. Application of the concepts contained in this study could be made to another on-line network such as BALLOTS. Again, this approach would contribute to the refinement and elaboration process. It would also provide additional data relative to generalizability.

ACQUISITIONS SEARCHING / VERIFICATION SUMMARY

Institution_____ Year_____

Source	Average speed (minutes)	Percentage found	Total found
National Union Catalogs			
Publishers Weekly			
Books In Print			
Forthcoming Books In Print			
Cumulative Book Index (CBI)			
Publishers' Catalogs			
Other (specify)			
LCLC			
Sub-total (average institutional performance)			

Institution_____ Year _____

Source	Number of units/sets	Percentage of cataloging	Average unit cost	Total cost	Turn-around time (in weeks)
Original					
LC Card Service					
LC Copy from NUC's					
Vendor (specify)					
Other (specify)					

UNIT COSTS BY ACTIVITY SUMMARY

Institution _____ Year _____

Activity	Unit pers. cost	Unit matls. cost	Unit equip. cost	Total unit cost

VENDOR/PUBLISHER SUMMARY

Institution_____ Year _____

Name of firm	Vols. recd. with full processing	Vols. recd. w/o processing	Sub-total	Percent of annual print acquisitions	Average turn-around time (in weeks)

INTERLIBRARY LOAN SUMMARY

Institution_____ Year _____

Institution	Requests sent to	Requests filled from	Requests received from	Requests filled to

CATALOG COPY SEARCHING SUMMARY

Institution_____ Year_____

Source	Average speed	Percentage found		
		With modification	Without modification	Sub-total
National Union Catalogs				
Other (specify)				
OCLC				
Sub-total (average institutional performance)				

EQUIPMENT COST ANALYSIS

Institution_____ Year _____

Equipment type	Initial cost	Projected lifespan	Annual cost of contract services	Activity used for

INSTITUTIONAL DATA SHEET

Institution	Collection size (volumes)	Volumes added 1976-77	Volumes added 1977-78 (proj.)	Student FTE	Library matls. budget	Staff (1976-77) Professional FTE	Staff (1976-77) Other FTE

LIBRARY MATERIALS EXPENDITURE SUMMARY

Institution_____ Year _____

Type of material	Number of titles	Average cost per title	Total cost	Title percent of materials budget
Non-print				
Print (monographs)				
U.S.				
Foreign language				
Jobber supplied				
Direct - publisher				
Print (serials)				
U.S.				
Foreign language				
Jobber supplied				
Direct - publisher				

Institution _____ Year _____

Type of material	Number of titles	Average cost per title	Total cost	Title percent of materials budget
Periodicals/newspapers				
U.S.				
Foreign language				
Jobber supplied				
Direct - publisher				
Other (specify)				
Totals				